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# An Argument Against Monetary Independence in a Flexible Exchange Rate Regime

## **Abstract**

Proponents of flexible exchange rates have long claimed that one of the main advantages of a flexible exchange rate regime is that It allows a nation to pursue an Independent monetary policy. Under a system of fixed exchange rates, the actions of the domestic monetary authorities are limited by their ability to finance a balance of payments deficit. Whether a nation is small (in the sense that its monetary authorities cannot control the nominal money supply) or large (in the sense that its actions can affect the world money supply) fixed exchange rates prevent the domestic monetary authorities from continually expanding the domestic component of the money supply at a rate greater than the rate of growth of the demand for domestic money.

## **Disciplines**

Economic Theory | Finance | Organizational Behavior and Theory | Strategic Management Policy | Taxation

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in a Flexible Exchange Rate Regime**

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Proponents of flexible exchange rates have long claimed that one of the main advantages of a flexible exchange rate regime is that it allows a nation to pursue an independent monetary policy. Under a system of fixed exchange rates, the actions of the domestic monetary authorities are limited by their ability to finance a balance of payments deficit. Whether a nation is small (in the sense that its monetary authorities cannot control the nominal money supply) or large (in the sense that its actions can affect the world money supply) fixed exchange rates prevent the domestic monetary authorities from continually expanding the domestic component of the money supply at a rate greater than the rate of growth of the demand for domestic money. As a flexible exchange rate eliminates the reserve constraint, it also gives the domestic monetary authorities control over the domestic money supply. Yet the term "independent monetary policy" connotes more than simple control over the nominal money supply. One such connotation is that disturbances in the domestic money market are isolated from disturbances in the foreign money market.<sup>1/</sup> A second, and more important, connotation is that the domestic monetary authorities can set an inflation rate which differs from the foreign inflation rate(s). The purpose of this paper is to show that if the term "monetary independence" is supposed to imply the independence of money markets or inflation rates, then a flexible exchange rate regime will not allow nations to pursue independent monetary policies. Instead, it will be shown that under a system of flexible exchange rates, the domestic inflation rate will be dependent upon changes in the foreign money market. Not only will it be shown that monetary actions of one

government act to change both the domestic and foreign inflation rate, it will also be shown that in certain reasonable circumstances the domestic and foreign inflation rate must be equal.

In standard international macroeconomic models it is commonly assumed that domestic residents only hold domestic money. This assumption is analytically useful for under such conditions it is possible to identify the Official Reserve Transactions Balance as one source of change in a nation's money supply. Yet simplifying assumptions necessarily entail costs as well as benefits. On the cost side, the assumption that domestic residents only hold domestic money necessitates abstracting from the capital gains or losses on domestic holdings of foreign money balances which arise whenever exchange rates change. As the capital gains and losses on domestic holdings of foreign bonds which arise from exchange rate changes are typically deemed important, there seems to be a fundamental asymmetry in models which assume that domestics hold foreign bonds but not foreign money.<sup>2/</sup>

While the official demand for foreign money balances would be greater with fixed, as compared to flexible, exchange rates, the private demand for foreign money balances would be greater with flexible exchange rates.<sup>3/</sup> Motives for such holdings naturally include those of portfolio diversification and reduced transaction costs. While the data concerning private inter-country money holdings is scanty, the sizes of the Euro-Swiss Franc, Euro-Deutsche Mark, Euro-Guilder and Euro-Dollar markets suggest that such currency holdings should be large. For as Guilders held in the Euro-Guilder market are imperfect substitutes for Guilder deposits in the Netherlands, the recent growth of the various Euro-markets suggests that the magnitude of total inter-country money holdings should be sizable.<sup>4/</sup>

In my recent paper with Professor Lapan,<sup>5/</sup> we demonstrated that domestic holdings of foreign money acts to reduce the efficacy of a devaluation. The model used in that paper, however, is not entirely suitable to analyze a system of flexible exchange rates for it assumes that individuals do not anticipate price or exchange rate changes. In the section below, the aforementioned model will be modified to allow for anticipations of price and exchange rate changes. It will then be shown that whenever domestic residents hold foreign monies, inflation rates must be linked.

### The Model

The model postulates a two country--say the U.S. and U.K.--one commodity world in which there is free trade. In order to highlight the interdependence of inflation rates, the simplest financial structure will be postulated. As such, it is assumed that monies are the only marketable assets and that residents of each country desire to hold the foreign money. It is further assumed that exchange rates are flexible and that individuals chose the mix of assets within their portfolios based upon real rates of return. The deposit rate on money is set equal to zero so that the real rate of return on dollars to U.S. asset holders will be minus one times the U.S. inflation rate. Correspondingly, the real rate of return on pounds, to U.K. residents, will be minus one multiplied by the U.K. inflation rate. U.S. residents holding pounds will earn a nominal rate of return equal to the rate of appreciation of the pound. In real terms, the rate of return on pounds to U.S. residents will be the rate of appreciation of the pound minus the U.S. inflation rate. U.K. residents holding dollars will receive a nominal rate of return equal to minus one times the rate of appreciation of the pound, and a

real rate of return equal to the nominal rate of return minus the U.K.

inflation rate. Thus:

- 1)  $r_{U.S.} = -\pi$
  - 2)  $r'_{U.S.} = g_e - \pi$
  - 3)  $r_{U.K.} = -g_e - \pi'$
  - 4)  $r'_{U.K.} = -\pi'$
- WHERE:  $r_{U.S.}$  ( $r_{U.K.}$ ) = real rate of return on dollars to U.S. (U.K.) residents  
 $r'_{U.S.}$  ( $r'_{U.K.}$ ) = real rate of return on pounds to U.S. (U.K.) residents  
 $\pi$  = U.S. inflation rate  
 $\pi'$  = U.K. inflation rate  
 $g_e = \frac{de}{dt} \frac{1}{e}$  = rate of appreciation of the pound

In this one good world, commodity arbitrage will ensure  $P = eP'$  so that:

- 5)  $\pi = g_e + \pi'$  and:  $P$  ( $P'$ ) = dollar (pound) price of commodities

Substituting equation 5 into equations 2 and 3, it is immediately seen that the real rate of return on dollars to both U.S. and U.K. residents is  $-\pi$ , and that the real rate of pounds to both U.S. and U.K. residents is  $-\pi'$ .<sup>6/</sup>

As real income is assumed constant, the U.S. (U.K.) demands for real assets can be expressed solely as a function of their real rates of return. In the absence of money illusion, nominal asset demands will be homogeneous of degree one in terms of the domestic price level:

- 6)  $M^D = PL(\pi, \pi')$
  - 7)  $eM'^D = PL'(\pi, \pi')$
  - 8)  $M^{FD} = eP'L^F(\pi, \pi')$
  - 9)  $M'^{FD} = P'L'^F(\pi, \pi')$
- WHERE:  $M^D$  ( $M^{FD}$ ) = U.S. (U.K.) demand for dollars  
 $M'^D$  ( $M'^{FD}$ ) = U.S. (U.K.) demand for pounds  
and:  $\frac{\partial L}{\partial \pi}, \frac{\partial L^F}{\partial \pi}, \frac{\partial L'}{\partial \pi'}, \frac{\partial L'^F}{\partial \pi'}$  are negative  
 $\frac{\partial L}{\partial \pi'}, \frac{\partial L^F}{\partial \pi'}, \frac{\partial L'}{\partial \pi}, \frac{\partial L'^F}{\partial \pi}$  are positive.

Thus, the total demand for dollars and pounds can be represented by:<sup>8/</sup>

- 10)  $D = PF(\pi, \pi')$
  - 11)  $D^p = P'F'(\pi, \pi')$
- WHERE:  $D$  = total demand for dollars  
 $D^p$  = total demand for pounds  
 $F = L + L^F$   
 $F' = L' + L'^F$

As the two money markets are linked and the real rates of return are the two inflation rates, it is relatively simple to show that the two inflation rates must be linked. This can be done by logarithmically differentiating equations 10 and 11 with respect to time:

$$10') \quad g_D = \pi + \eta_1 g_\pi + \eta_2 g_\pi, \quad \text{WHERE: } g_X = \text{rate of growth of variable } X = \frac{dX}{dt} \frac{1}{X}$$

$$11') \quad g_{D'} = \pi' + \eta_1' g_\pi + \eta_2' g_\pi, \quad \eta_1 \quad (\eta_2) = \frac{\partial F}{\partial \pi} \frac{\pi}{F} \left( \frac{\partial F}{\partial \pi'} \frac{\pi'}{F} \right)$$

$$\eta_1' \quad (\eta_2') = \frac{\partial F'}{\partial \pi} \frac{\pi}{F'} \left( \frac{\partial F'}{\partial \pi'} \frac{\pi'}{F'} \right)$$

these elasticities are assumed to be constant

and:  $\eta_1 < 0, \eta_2 > 0, \eta_1' > 0, \eta_2' < 0$

From equation 10' (11') it is seen that whenever the U.K. (U.S.) inflation rate is changing, the rate of growth of the U.S. (U.K.) demand for money will be affected. If the market for dollars is initially in equilibrium with the U.S. inflation rate equal to the rate of growth of the supply of dollars, a changing U.K. inflation rate will result in a discrepancy between the demand and supply of dollars. Without a change in the rate of growth of the supply of dollars, equilibrium in the market for dollars can only be restored by a changing U.S. inflation rate.

It is well known that setting equations of the form 10' and 11' equal to the corresponding rates of growth of the money supply will lead to instability.<sup>9/</sup> For stability, prices must respond to monetary growth with a lag. One reasonable dynamic postulate is that  $g_\pi$  ( $g_{\pi'}$ ) is proportional to the rate of growth of the supply of dollars (pounds) minus the rate of growth of the demand for dollars (pounds).<sup>10/</sup> Setting these constants of proportionality equal to unity:

$$12) \quad g_\pi = g_m - \pi - \eta_1 g_\pi - \eta_2 g_\pi, \quad \text{WHERE: } g_m \quad (g_{m'}) = \text{rate of growth of the supply of dollars (pounds)}$$

$$13) \quad g_{\pi'} = g_{m'} - \pi' - \eta_1' g_\pi - \eta_2' g_\pi,$$



Rearranging and substitution yields:

$$12') \quad \frac{\dot{\pi}}{\pi} = \frac{(1 + \eta_2')(g_m - \pi) - \eta_2[g_m' - \pi']}{(1 + \eta_1 + \eta_2' + \eta_1\eta_2' - \eta_1'\eta_2)}$$

$$13') \quad \frac{\dot{\pi}'}{\pi'} = \frac{(1 + \eta_1')(g_m' - \pi') - \eta_1'(g_m - \pi)}{(1 + \eta_1 + \eta_2' + \eta_1\eta_2' - \eta_1'\eta_2)}$$

From equations 12' and 13' it is immediately seen that long run equilibrium requires  $g_m = \pi$  and  $g_m' = \pi'$ . Thus, if the system is stable, the monetary authorities can attain independent inflation rates in the long run. In the short run, or if the system is unstable, inflation rates will be interdependent. In the standard case, in which domestics only hold domestic currency ( $\eta_2 = \eta_1' = 0$ ), equations 12' and 13' can be solved independently. As such, the domestic inflation rate will be independent of the foreign rate, and each equation will converge if the inflation rate elasticity of the demand for dollars (pounds) is greater than minus one. When assets are imperfect substitutes, the two inflation rates will be linked and overall stability of the system will depend upon the magnitudes of both the direct and cross interest rate elasticities. As many combinations are possible, and as the purpose of this paper is to examine the interdependence of inflation rates, sufficient conditions for stability will be postulated. The system will always converge to equilibrium if the following three conditions hold:

- a)  $1 + \eta_1 > 0$
- b)  $1 + \eta_2' > 0$
- c)  $1 + \eta_1 + \eta_2' + \eta_1\eta_2' - \eta_1'\eta_2 > 0$

Given these conditions, it is possible to determine the time path of the system. The loci of points for which  $\dot{\pi}$  and  $\dot{\pi}'$  are zero are given by equations 14 and 15 respectively:

$$14) \quad g_m - \pi - \frac{\eta_2}{1 + \eta_2'} (g_m' - \pi') = 0$$

$$15) \quad g_m' - \pi' - \frac{\eta_1'}{1 + \eta_1} (g_m - \pi) = 0$$

These two loci are plotted in figure 1 as AA and BB respectively. AA is positively sloped as condition (b) guarantees  $(1 + \eta_2')/\eta_2$  is positive, and BB is positively sloped as condition (a) guarantees  $\eta_1'/(1 + \eta_1)$  is positive. Condition (c) guarantees that the slope of AA is greater than the slope of BB: thus condition (c) ensures that the demand for pounds is relatively more sensitive to the U.K. inflation rate (as compared to the U.S. rate) than in the demand for dollars.<sup>11/</sup>

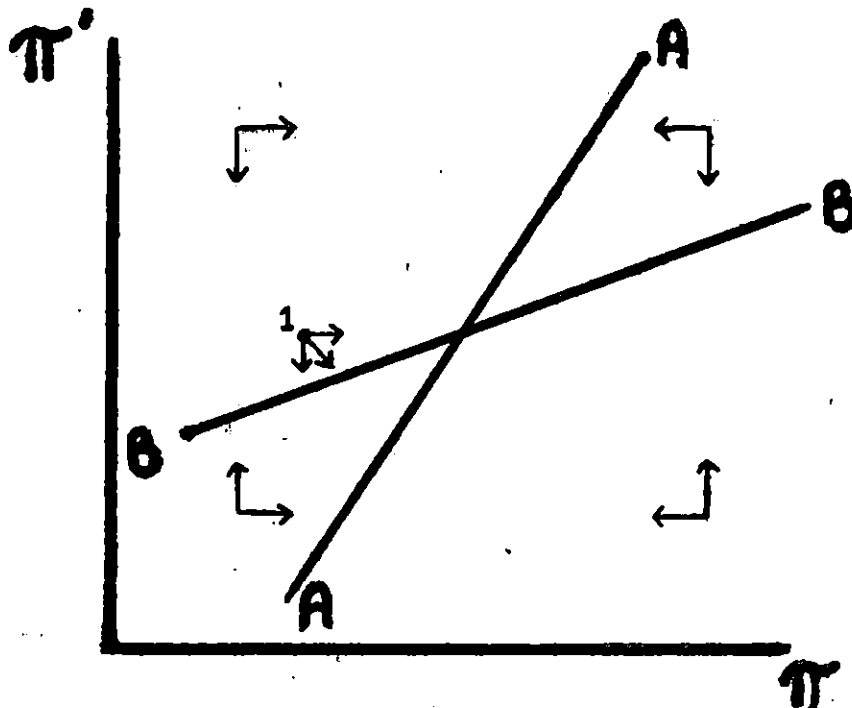


Figure 1

Conditions b and c, together with equation 12' ensure that the U.S. inflation rate will rise at all points to the left and above the AA locus and fall at all points to the right and below the AA locus. In the same manner, conditions (a) and (c), together with equation 13', ensure that the

U.K. inflation rate will fall at all points to the left and above the BB locus and rise at all points to the right and below the BB locus. Given these conditions the system will be cyclically stable as at least one vector always moves the system towards equilibrium.

The important point, however, is that the inflation rates are inter-dependent. Consider the case in which the two money supplies and inflation rates are all growing at the same rate. Let these be a shock to the system such that the rate of growth of the U.S. money supply increases but the rate of growth of the U.K. money supply remains unchanged. Thus, the initial conditions will be such that the U.S. inflation rate is less than the long run equilibrium rate, while the U.K. inflation rate is consistent with long run equilibrium (point 1 in figure 1). With  $g_m > \pi$  and  $g_m' = \pi'$ , equation 12' shows that the U.S. inflation rate will begin to increase. The U.K. inflation rate will not remain constant for as the U.S. inflation rate increases, asset holders will attempt to substitute pounds for their dollar holdings. The increase in the demand for pounds will mean that the rate of growth of the U.K. money supply is now less than the rate of growth of the demand for pounds. Under these conditions, equation 13 demonstrates that the U.K. inflation rate will begin to decrease. This process can be explained in a somewhat more intuitive way if the role of commodity arbiters is considered. When the asset holders attempt to substitute pounds for dollars, upward pressure is put on the pound. The pound, however, cannot appreciate by more than the disparity between inflation rates. Instead, the additional upward pressure on the pound will induce commodity arbiters to purchase U.S. as opposed to U.K. goods. This action will lead to a greater U.S. inflation rate and a reduction in the U.K. inflation rate.

The point is that inflation rates must be linked. As a change in a nation's inflation rate will alter the rate of return on that nation's currency, it will induce a change in desired portfolio composition. As long as different currencies are viewed as substitutes, a change in the demand for one nation's currency will result in a change in the demand for the other. As such, the real rates of return on currencies (inflation rates) must be linked. This point can be made most dramatically in the special case in which the two monies are viewed as perfect substitutes. In this special case, equilibrium in the asset markets will require the two rates of return to be equal, i.e., equilibrium requires that  $\pi = \pi'$ . In this case, then, governments will not be able to pursue independent inflation rates, even in the long run. Thus, while flexible exchange rates eliminate the reserve constraint, the monetary authorities will not be able to pursue independent inflation rates, even in the long run. In terms of the dynamic structure given by equations 12 and 13, the assumption that the two monies are perfect substitutes will lead to an unstable system. Under such conditions the monetary authorities in each country would be forced to agree on a common inflation rate. Yet, if an alternative dynamic structure is postulated for which the system is stable, the two inflation rates would still necessarily be equal. The properties of a flexible exchange rate system would be identical to that of a fixed rate system, i.e., equal rates of inflation.

#### Conclusion

This paper has argued that it is important to consider the effects of domestic holdings of foreign currencies in assessing the benefits of a flexible exchange rate system. The simplest possible model was postulated which demonstrated that inflation rates under flexible exchange rates are not independent when domestics hold foreign currency. In postulating a

simple model, however, several important questions have been overlooked. In particular, it is of interest to know how the presence of a bond market, and the existence of more than one good would affect the results presented above. The model presented considered two large countries. It would also be of interest, however, to examine a small country model. When foreign residents hold domestic currency, the monetary authorities in a small country do not have complete control over the domestic money supply when money is defined as in Burger and Balbach (1972).

## Footnotes

- \* Assistant Professor of Economics, Iowa State University. The author is grateful to Dennis Starleaf and Roy Gardner for their comments on the ideas presented in this paper.
1. Mathieson (1976) considers the effects of foreign monetary expansion on the domestic inflation rate in a model in which individuals do not fully anticipate exchange rate changes. He finds that countries will have independent inflation rates if individuals do fully anticipate such changes. In the model developed below, it will be assumed that the expected and actual inflation rates are equal.
  2. For example, in Mathieson (1976) the domestic rate of interest is equal to the foreign interest rate plus the rate of appreciation of the foreign currency. A similar relationship should hold for real rates of return on monies.
  3. See McKinnon (1969), Machlup (1964) pp. 267-76, or Mikesell and Furth (1974) concerning the motives for holding foreign money balances under a flexible exchange rate regime.
  4. Mikesell and Furth (1974) make a similar point on page 62.
  5. See Lapan and Enders (1976).
  6. Consider a U.S. resident holding a pound when the exchange rate is initially \$1/1£. If at the end of one year the U.S. resident decides to purchase U.K. goods, the real value of the pound will be  $-\pi'$ . Alternatively, the U.S. resident can purchase goods in the U.S. at the end of the year. In dollar terms, the pound will yield  $(1 + g_e)$  dollars. In real terms, these dollars will be worth  $(1 + g_e - \pi) = (1 - \pi')$  dollars. Thus, the real rate of return on pound holdings to U.S. residents will always be  $-\pi'$  which is equal to the real rate of return on pounds to U.K. residents.
  7. Note that  $M^D$  and  $M^{FD}$  are denominated in terms of dollars and  $M'^D$  and  $M'^{FD}$  are denominated in pounds. Thus,  $eM'^D$  is the dollar value of the pounds demanded by U.S. residents and  $M^{FD}/e$  is the pound value of dollar demanded by U.K. residents.
  8. Equations 10 and 11 make use of the fact that  $P = eP'$ .
  9. Consider the simple model:  $M = PL(\pi)$  where:  $M$  = money supply. Thus:  $g_m = \pi + \eta_{\pi} \dot{\pi}/\pi$  where:  $\eta_{\pi} = \frac{\partial L}{\partial \pi} \frac{\pi}{L} < 0$ ,  $\dot{\pi} = d\pi/dt$ . So that:  $\dot{\pi} = (g_m - \pi)\pi/\eta_{\pi}$ . Consider the initial  $g_m > \pi > 0$ . Under these circumstances  $\dot{\pi}$  is negative. Thus, prices must respond to monetary growth with a lag.

10. As only positive inflation rates will be considered there will be no qualitative difference between this assumption and the assumption that the change in the inflation rate is proportional to the discrepancy between the rate of growth of the money supply and money demanded. Either dynamic assumption can be defended in several ways. If the U.S. money supply is growing faster than the demand, dollar holders will attempt to substitute pounds for dollars in their portfolios. This desired change in asset composition will put upward pressure on the pound. Without a change in inflation rates the pound cannot appreciate, but the upward pressure on the pound will induce commodity arbiters to purchase U.S. goods. Thus, dollar prices will rise if the rate of growth of dollars is greater than the rate of growth of the demand for dollars. Alternatively it could be argued that if the rate of growth of dollars is greater than the rate of growth of the demand for dollars, U.S. residents will increase their expenditures on U.S. goods.
11. Note that AA (BB) is not the locus of inflation rates for which the demand for real dollars (pounds) equals the supply.

## References

- Burger and Balach, "Measurement of the Domestic Money Stock," Federal Reserve Bank of St. Louis Review, May 1972.
- Lapan and Enders, "Capital Mobility and Devaluation in a Monetary Approach to the Balance of Payments," Department of Economics Staff Series Paper No. 34. Iowa State University, 1976. Revised version forthcoming, American Economic Review.
- Machlup, F., International Payments, Debts, and Gold, Charles Scribner's Sons, 1964.
- Mathieson, D., "Monetary Interdependence Under Flexible Exchange Rates," Research Departmental Memoranda Series, International Monetary Fund, 1976.
- McKinnon, R., "Private and Official International Money: The Case for the Dollar," Essays in International Finance, Princeton, 1969.
- Mikesell and Furth, Foreign Dollar Balances and the International Role of the Dollar, National Bureau of Economic Research, 1974.